INVESTIGATING THE HEALTH STATUS OF THE YAKUT:
An Analysis of Residence and Sex Differences in Blood Pressure

Sloan Elizabeth Eberly

A thesis submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Arts in the Department of Anthropology.

Chapel Hill
2006

Approved by:

Dr. Mark V. Sorensen

Dr. Dale L. Hutchinson

Dr. Paul W. Leslie

ABSTRACT

SLOAN EBERLY: Investigating the Health Status of the Yakut: An Analysis of Residence and Sex Differences in Blood Pressure
(Under the direction of Dr. Mark V. Sorensen, Dr. Dale L. Hutchinson, and Dr. Paul W. Leslie)

This paper investigates the impact of culture change on the Yakut, an indigenous population in Siberia. Variation in systolic and diastolic blood pressure was compared for two grouping variables of residency status (urban/rural and isolated/not isolated) and between the sexes. Rural and isolated residents exhibited significantly higher mean systolic blood pressure values than their urban and not isolated counterparts. Diastolic blood pressure was found to be significantly elevated for isolated residents. There was no significant difference in diastolic blood pressure between rural and urban residents. Men had higher mean systolic and diastolic blood pressure than women. Age and three measures of adiposity were also incorporated into the analysis. The relationship between these measures and blood pressure was evaluated. These results indicate traditional theories of modernization are insufficient when attempting to conceptualize the unique experience of Siberians. Culture change may be a more accurate framework in which to evaluate this phenomenon.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

CHAPTER 1

INTRODUCTION

Objective

The collapse of the Soviet Union has resulted in profound political, economic, and social changes for indigenous Siberians. Following the collapse of the collective farming system, individuals must now adopt their own subsistence strategies. For many, this means a return to traditional practices; for others, it involves integration into the market economy. It is anticipated that these different strategies will result in different health consequences for individuals. In this analysis, the focus will be upon blood pressure values among a specific indigenous population in Siberia, the Yakut. Variation in blood pressure will be evaluated by sex and residence locale.

The purpose of this study is to identify potential pathways contributing to variation in blood pressure among the Yakut in different residence locations. As in the rest of Siberia, the collapse of communism in 1991 has resulted in the adoption of different lifestyle strategies for this population. Systolic and diastolic blood pressure values for seven different residence locations in the Republic of Sakha (Yakutia) will be analyzed to determine the impact of residence location upon blood pressure. While the broader economic and political changes experienced by the Yakut are universal, individuals pursue different strategies relative to residence location. Some Yakut began pursuing wage employment, while others rely primarily on household level subsistence. These distinctions can be grouped by location and potential differences in blood pressure can be evaluated.

Additionally, this paper evaluates potential sex differences in blood pressure. Men and women generally behave according to socially prescribed gender roles in Yakutia. These differences in behavior and worldviews will translate into distinctions between the sexes in regard to blood pressure.

Age and three measures of adiposity are also included as independent variables in this analysis. The three measures of adiposity are body mass index (BMI), subscapular skinfold thickness, and waist circumference. By evaluating differences in these measures among the grouping variables (rural/urban, isolated/not isolated, and sex), a greater understanding of the characteristics of the population is developed. This will provide insight into the possible reasons that distinctions in blood pressure exist among the grouping variables.

The issues discussed in this paper arose from my observations among another indigenous population, the Altai, in the summer of 2005. Prior to visiting the region, it was anticipated individuals would be optimistic about life after the dissolution of the Soviet Union, due to increased individual freedom and autonomy. It was surprising to discover through ethnographic analysis that the great majority of individuals expressed a desire to return to the collective system. Many appeared to lament the loss of security the system provided. These observations led to questions regarding the strategies individuals have adopted to survive outside the collective system. Additionally, it resulted in inquiries as to how these decisions impacted their health status. The collapse of communism provides a fascinating example of how individuals adapt to rapid culture change, particularly because change was not an option. All Siberians were forced to adopt new strategies for survival.

The Utility of Blood Pressure

Hypertension is a worldwide phenomenon with serious health consequences. It is identified as the most common risk factor for cardiovascular morbidity and mortality (Kaplan and Opie 2006). Currently, more than a fourth of the world's population is hypertensive and researchers predict the global burden by 2025 could be 1.56 billion individuals (Kearney et al. 2005). Hypertension is a complex health problem because multiple factors contribute to elevations in blood pressure. By developing a better understanding of the contributing factors to hypertension, researchers and policy makers are better able to implement programs focused on preventing the condition in individuals. In addition to being an important predictor of the future burden of chronic disease in populations, hypertension also provides a tool to assess populations cross-culturally. Because the same biological condition is being assessed, variation in blood pressure values can be used as a tool to gain insight into differences between populations (Dressler, 1995).

The goal of the researcher in studying blood pressure is two-fold. First, it is important to identify behavioral, genetic, and environmental factors contributing to elevations in blood pressure in the individual. It is also important to evaluate how cultural differences contribute to variation in blood pressure at the population level. The objective within this paper incorporates this two-fold approach. Ultimately, blood pressure variation occurs at the level of the individual. However, population-level changes in the social, political, and economic environment impact individuals so variation will be demonstrated between populations. These changes are witnessed in many communities incorporated into the global market. Indigenous Siberians are currently undergoing such changes.

Defining Hypertension

Hypertension is defined as elevated blood pressure exceeding 140/90 mmHg, as defined by the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (Chobanian et al. 2003). These standards establish blood pressure of <120/80 mmHg as normal, between 120-139/80-89 mmHg as 'pre-hypertensive', and ≥140/90 mmHg as hypertensive. Hypertension is a causal factor in a suite of cardiovascular diseases. Complications attributed to high blood pressure include heart attack, stroke, ischemic heart disease, and kidney disease.

The parameters for defining hypertension are well established, however, understanding the causes of the condition are more complex and debated. Paul T. Baker (1997) provides a helpful framework in which to conceptualize the contributing factors to hypertension. The framework identifies genetics, the physical environment, and culture as all contributing to the expression of a particular phenotype. Conceptualizing hypertension within this framework allows researchers to identify multiple causal pathways contributing to a given phenomenon. Factors such as genetic inheritance, diet, physical activity level, stress, body composition, age, and sex can elevate blood pressure.

Culture Change and Blood Pressure

It is necessary to introduce a framework in which to understand the changes experienced by indigenous Siberians after the collapse of the Soviet Union. Broadly, all populations in Siberia were forced to change from the collective system to a market economy. This has resulted in the introduction of new ideas, products, and languages from outside the Russian state. Additionally, it has contributed to increased social stratification in a population that was previously, at least in theory, egalitarian. It is important to understand the relationship between the changing social structure and its impact on health status.

Many studies cite the impact of modernization as being central to understanding increases in hypertension in populations (Dressler 1995, Dressler and Bindon 1997, Schall 1995). In these studies, the central argument states modernization incorporates a suite of behavioral and socio-cultural changes. Behavioral changes, such as a reduction in physical activity levels, result in increases in body mass index (BMI), which is significantly associated with blood pressure elevation (Gerber et al. 1995). Socio-cultural changes should not be thought of as mutually exclusive to behavioral changes. However, they also provide another, more elusive, variable to evaluate. This is individual perception of the changing environment. This change can result in uncertainty concerning an individual's place in society. Additionally, changing social relations can contribute to this confusion. This creates increased stress upon the individual, resulting in increases in blood pressure (Dressler 1995, Dressler and Bindon 1997).

For the purposes of this paper, a more accurate descriptive term than modernization for the changes experienced by the Yakut is culture change. Culture change can refer to a variety of different phenomena occurring in a population. This includes cultural contact, innovation, diffusion of a particular cultural concept, or natural disasters (Berry 1984). Culture change has been widely used to explain the process of development and its consequences in populations (Brown 1982, Wessen et al. 1992). This terminology removes any connotation of unidirectional development associated with modernization (Baker 1986).

The Post-Soviet context highlights the heterogeneous and uneven process of globalization. Globalization, in its simplest terms, refers to an increase in economic activities across national borders, specifically in the areas of international trade, international investment, and international finance (Nayyar 2006). However, it would be remiss not to expand this definition to incorporate the changing political, social, and cultural relations associated with globalization (Holm and Sorensen 1995). Globalization is uneven in the sense that this process does not occur uniformly between or within national borders. The intensity and scope of globalization is variable depending on where the process is occurring. Russia had a rather awkward introduction into the global marketplace, because many nations were already facing the challenges of globalization before the end of the Cold War (Zubok 1995). Russia did not fully face these issues until after the collapse of communism. The rapid introduction of this nation into the world market resulted in economic hardship for most Russians. This uneven process also appears to be occurring within the villages of Siberia. Some areas are developing while others are becoming increasingly isolated. The investigation of blood pressure in this paper will give some indication of the consequences of residing in these two types of residences.

The concepts of uneven globalization and culture change are useful for outlining the adoption of the capitalist system in Yakutia. The use of the term modernization is insufficient for this analysis for several reasons. The term implies a simple dichotomy-traditional versus modern. This simplifies the complexity of the modernization process. Multiple factors determine a population's level of modernization. William Dressler identifies these factors as integration into a market economy, reliance upon wage labor, increased consumerism, decreased emphasis upon traditional social structure, and an increased utilization of non-local languages (1999). Stephen T. McGarvey et al. (1989) define modernization specifically in relation to its impact on the biology of individuals.

"Modernization can be viewed in this context as arising from the transformation of relatively less complex socioeconomic systems based on simple technologies and intensive human physical efforts to systems of industrial technology and minimal human physical labor" (McGarvey et al. 1989:263).

Paul T. Baker cites a cash economy, formal education system, secular government, and the presence of urban units as characteristic of a modern population (Baker et al. 1986). Baker notes a great deal of heterogeneity in these designations. He advises structuring comparative scales between regions, communities, and individuals to rank levels of modernity (Baker et al. 1986). None of these components are absolute measures and can only be evaluated in relative terms. When evaluating the definitions of modernization utilized by various researchers, a concrete understanding of what constitutes a modern population becomes increasingly ambiguous.

Certain generalizations about modernization can be made from the Western model of development and the rapid development of many low- and middle-income countries in the 20th century. In general terms, the process of modernization is associated with an increase in body weight and adiposity resulting from a reduction in physical activity and an increase in food consumption (McGarvey et al. 1989). As modernization occurs in a society, the mean adult weight increases. However, this process is not homogenous across a population. There will be a level of variability associated with an individual's experience within this changing social and economic environment. Therefore, individual integration into the modern economy and adoption of a more modern lifestyle will determine the degree to which the biological effects of modernization are expressed. The adverse effects witnessed will be proportional to the amount of change (Baker et al. 1986). This macro- versus micro-level distinction is significant because broad social and economic changes affect individual activities such as occupation, mobility, education, and behavior in different ways and to varying degrees. The variability in the nature of an individual's experience in a changing social and economic environment highlights the importance and necessity of careful ethnographic work in addition to population-level analysis (Dressler 1995).

However, when age and body mass index (BMI) are controlled for in individuals, there is still an aspect of elevated blood pressure that is not accounted for (Dressler 1999). This is explained through a pathway that is less easily defined and analyzed. Another factor attributable to the rise in CVD and blood pressure associated with modernization is an increase in psychosocial stress. The increase in stress associated with modernization has been sighted as a factor contributing to increases in blood pressure in men, but is less clearly demonstrated in women (Dressler 1999, Hutchinson and Byard 1987, Schall 1995).

Culture change among the Yakut

The issue of culture change for the Yakut, and indigenous Siberian populations broadly, is a complex one. Often times, the process of change is seen as unidirectional, with relative levels of education, material culture, value orientation, and integration into a market economy creating variability. For the Yakut, this process has been bidirectional. Indigenous Siberians are not characterized by those who adopted a different lifestyle and those who resisted change. It involved the conscious adoption of different patterns of behavior and social organization for all participants. A brief history of the Yakut will illustrate what is meant.

The Yakut constitute approximately 400,000 of the 1.3 million native peoples in Siberia (Sorensen et al. 2005). The language is composed of Turkic vocabulary and grammar, with Mongolian and Tungus influences (Anderson 2000). Contact between native populations and Russians began in the 16th century. Russians used the Siberian landscape as a dumping ground for political prisoners. Additionally, Russians utilized plentiful livestock resources in Siberia, and indigenous populations were required to pay tribute in the form of animal resources (Forsyth 1992). Resentment among indigenous populations grew, fueled in part by the political prisoners exiled to the region. The first Yakut national movement began during the 1905 Revolution. This movement and others resulted in the Yakut withholding taxes and labor from the Russian government, while demanding greater autonomy, civil rights, and representation in the Duma in St. Petersburg (Forsyth 1992).

By the 1930's, the communist party under the firm leadership of Stalin began the process of collectivization. By 1937, 71% of the Yakut were members of collective farms (*kolkhozy*). This resulted in great changes in subsistence strategies. Traditionally, the Yakut patterns of subsistence were contingent upon environmental constraints and consisted of hunting, fishing, and pastoralism. Following collectivization, the Yakut were structured into farming, fishing, and fur-trapping settlements (Forsyth 1992). Additionally, Russian influences and coercion resulted in social and cultural changes for the native populations. Shamanistic practices were denounced and discouraged as Stalin strove to create a homogenous state (Slezkine 1992).

The process of collectivization had a profound impact on indigenous populations in Siberia. For one, it created a great dependence on the Soviet government for supplemental wages and certain foodstuffs. Krupnik (1993) argues collectivization created greater food security for indigenous populations, specifically the Chuckchi and Nenets. Leonard et al. (1996) presents evidence of total energy expenditure (TEE) from the Evenki, an indigenous population in Eastern Siberia, to demonstrate the biological effects of collectivization. While evidence of increases in stature suggests that food security increased, Leonard et al. states, "changes associated with collectivization have had a larger and potentially more negative impact on the biology and health of Evenki women" (1996:287).

The greater availability of food and a reduction in physical activity resulted in 27% of Evenki women having a BMI greater than 27 (compared to 6% for males). This demonstrates the process of collectivization, and the biological repercussions of such change, varied along gender lines. For both groups, mobility was limited to encampments. However, men were still responsible for herding reindeer and building fences. For women, most physical demands were dramatically reduced. Women were responsible for maintaining the camp, however, the responsibility of preparing hides for clothing and shelter was no longer necessary, as the Soviet government provided these supplies.

The process of collectivization brought industrialization and urbanization to Siberia. Many Yakut were employed in a highly industrial form of agriculture or worked in animal husbandry. These individuals survived on wage employment. Additionally, individuals became specialized in the types of work performed on the collective (Sorensen et al. 2005). When decollectivization occurred, the livestock and land was to be divided fairly among workers. However, politics and social relations resulted in the uneven distribution of resources. This caused social stratification among a population that was previously, in theory, egalitarian.

The process of collectivization resulted in great reliance upon the Russian government for support. Previously autonomous populations became dependent on the state for certain foodstuffs and supplies. When the system began to falter and eventually collapse in the 1980's, many Siberians were forced into extreme poverty because of dependence on the government for wages and certain necessary resources (Leonard et al. 2005). The process resulted in many indigenous Siberian populations adopting different strategies for survival. Some returned to traditional subsistence practices, while others sought employment in the private sector.

The process of decollectivization is resulting in the renewal of shamanistic practices among many indigenous Siberians (Wolfe 2000). This movement marks the recognition of the end of an enforced Soviet identity and a resurgence of nationalism among native populations. This also demonstrates that the desire to be integrated into a global marketplace is not demonstrated by all populations in Siberia. The concept of modernization fails to properly theorize the trend for the renewal of traditional practices. This is yet another reason why use of the term modernization to explain the changes experienced by the Yakut is only sufficient to the extent that it is qualified.

Summary of Introduction

A theoretical argument has been outlined above to guide the statistical analysis of the Yakut population. Factors impacting blood pressure can be tested among the Yakut. The primary objective will be to analyze the different experiences of the Yakut resulting from the adoption of differing behavioral strategies after the collapse of communism. This change will translate into variable impacts on the health status of the Yakut in these residence locations. The effect on blood pressure of men and women adopting different behavioral strategies also will be evaluated. Because the effects of these strategies will impact the sexes differently, blood pressure can be used as a marker of the influence of culture change.

It is anticipated higher blood pressure values will be seen in the residence locations that are more integrated into a market economy. Based on the literature, integration into the market economy results in behavioral changes, including a reduction in physical activity levels and consumption of a high calorie, low nutrient diet (Gerber et al. 1995). This results in increases in adiposity (fat stored in the fatty tissue of the body), which has been associated with elevated blood pressure levels (Kannel et al. 1967, Stamler 1991, Schall 1995, Cooper et al. 1997, Gerber and Stern 1999, Kaufman et al. 1999). A critical element of the analysis will be to determine if various measures of adiposity are associated with increases in hypertension.

Men residing in locations that are more integrated into a market economy should demonstrate higher mean blood pressure values than women residing in these same locations (Schall 1995). This is because the sexes have differing socially dictated gender roles, which determine their experience in these different residences. It is anticipated among the Yakut that men will experience the effects of culture change more acutely than women because it is their responsibility to be the primary provider of subsistence for the household.

It will also be necessary to look at variability in age between the sexes and individuals in different residence locations. Age is positively associated with blood pressure (Chobanian et al. 2003). As a result, it will be important to control for variation in the age of populations as it can function as a potential confounder in the analysis.

CHAPTER 2

METHODS AND TECHNIQUES

Subjects

The data used in the present analysis was gathered in coordination with the Ministry of Health of the Republic of Sakha (Yakutia) and the Institute of Health of the Academy of Sciences of the Republic of (Sakha) Yakutia. The anthropometric measures were taken as part of a representative, cross-sectional household survey administered in 2001. This analysis includes data from two districts from the Republic of Sakha (Yakutia). From the two districts, 429 individuals from seven villages are included in the present analysis. Basic characteristics of the individuals were recorded, including sex, height, weight, and age. Additionally, measurements of diastolic blood pressure, systolic blood pressure, body mass index (BMI), waist circumference, and subscapular skinfold thickness were provided.

Data was gathered from three villages in the district of Gorny *Ulus*. This is a district with a population of 11,500 individuals and a total land area of 45,600 km^2. Population density is low and the district is primarily rural, relying on herding of cattle, reindeer, and horse. The three villages studied within the district of Gorny *Ulus* are Dikimdye, Asyma, and Berdygestiakh. Dikimdye has a population of 850 individuals. The community formed its own collective system after the breakdown of Soviet infrastructure. Asyma has a population of 1,000 individuals. This village is primarily isolated. In contrast to Dikimdye, Asyma became cut off when the collective system went bankrupt and, as a result, there are many abandoned homes in the village. Berdygestiakh has a population of 4,000 individuals and is the district administrative center.

The second district, Megino-Kangalassky *Ulus*, has a population of 32,900 individuals and covers 11,200 km^2. From these figures, it is clear this district has a higher population density than Gorny *Ulus*. It is more economically developed and milk production is the central commercially produced resource. Cattle and horse herding are primary means of subsistence and revenue in the district. Four villages were sampled from Megino-Kangalassky *Ulus*. Khorobut has a population of 650 and is primarily isolated from surrounding villages. 11,500 individuals reside in Maia. This is the administrative center of Megino-Kangalassky *Ulus* and the economy is fueled by one of the few paved highways in the district. There is a water pipeline currently in development for the village. Tiungiuliu is locate 75 km from Maia and has a population of 4,000. Nizhny Bestakh is a port city inhabited by 5,000 people.

Anthropometric Measures

The following anthropometric measures are utilized within this analysis: height, weight, BMI, waist circumference, subscapular skinfold thickness, diastolic blood pressure, and systolic blood pressure. Height is measured to the nearest 1mm and weight is measured to the nearest 100g. Skinfold thickness was taken using Lange calipers and measured to the nearest 0.5mm. Blood pressure was determined using an aneroid sphygmomanometer with a manually inflated blood pressure cuff and measured to the nearest mmHg.

Statistical Analysis

Statistical analysis was computed using SPSS 12.0 Software (SPSS Inc., 2003). T-tests were computed to determine the difference between systolic and diastolic blood pressure in rural and urban locations. The samples from Dikimdye, Asyma, and Khorobut were classified as rural. Berdygestiakh, Maia, Nizhny Bestiakh, and Tiungiuliu were all classified as urbanized towns. Residences were classified as rural if the population was 1,000 individuals or less and there was little participation in the market economy.

The seven residence locations were then regrouped based on location in or near an administrative center. The two categories derived were isolated and not isolated. Using this criterion, Asyma and Khorobut were isolated based on the level of contact with the administrative center of the district, while the other five locations were considered not isolated. T-tests were conducted based on these grouping variables for residence. Since a critical component of this analysis involved examining the difference between blood pressure values in men and women, a t-test was used to determine the difference in mean systolic and diastolic blood pressure between the sexes.

Pearson correlations were conducted to determine the relationship between the variables of BMI, waist circumference, and subscapular skinfold thickness. Since all these variables measure a similar phenomenon (adiposity), there was concern that inclusion of all these measures in linear regressions would mask some of the variation influencing blood pressure.

Linear regressions were conducted to determine the amount of variance in systolic and diastolic blood pressure that could be accounted for by age, sex, residence location, BMI, waist circumference, and subscapular skinfold thickness. Regressions were run separately using systolic and diastolic blood pressure as dependent variables.

CHAPTER 3

RESULTS

Mean Values for Systolic Blood Pressure

Table 1 and Table 2 provide descriptive statistics for the study population taken from the seven villages. Females represent a greater portion of the sample than males (female=298; males=131). The percentage of females in the total sample varies from 57.6% in Berdygestiakh to 75.5% in Tiungiuliu. The data was collected during the summer months when men are away from the village gathering hay to last through the winter. Therefore, females were more accessible for the survey.

A summary of the mean values of the variables used in this analysis is provided in Tables 3, 4, and 5. Table 3 outlines the variables of age, BMI, waist circumference, subscapular skinfold thickness, diastolic blood pressure, and systolic blood pressure in relation to rural and urban residence. Table 4 investigates the same variables in relation to residence in isolated and not isolated communities. Table 5 examines these variables in relation to sex. Significance values are provided for the three tables.

The mean systolic blood pressure was 131 mmHg for urban residents and 141 mmHg for rural residents ($P<0.01$). When comparing difference in mean systolic between isolated and not isolated residences, again a statistically significant difference existed ($P<0.01$). The mean systolic blood pressure was 146 mmHg for isolated residents and 132 mmHg for not isolated residents.

Additionally, there were differences in mean systolic and diastolic blood pressure between the sexes for the two different residence groupings. In rural villages, the mean systolic blood pressure for women was 137 mmHg. This contrasts with men in these villages; their average systolic blood pressure was 149 mmHg. Diastolic blood pressure also saw similar differences. For women in rural communities, 80 mmHg was the average diastolic blood pressure. For rural men, this value was 88 mmHg. Urban residents had lower average blood pressure values than rural residents, but men demonstrated higher average diastolic and systolic blood pressure values than women. This is the same phenomenon that was witnessed in rural villages. Women residing in urbanized towns had an average systolic blood pressure of 129 mmHg. Urbanized males' systolic value was 137 mmHg. There was a less dramatic difference in diastolic values. Urban women had an average diastolic value of 80 mmHg. Urbanized men averaged 83 mmHg.

These distinctions in blood pressure between the sexes were also demonstrated when individuals were grouped into isolated and not isolated residences. Women in isolated communities had an average systolic blood pressure of 143 mmHg and an average diastolic value of 84 mmHg. Men in isolated communities had an average systolic blood pressure value of 151 mmHg and an average diastolic of 92 mmHg. Women in communities that were not isolated had an average systolic blood pressure of 128 mmHg and an average diastolic of 79 mmHg. Men's average values were higher than women in not isolated communities. The male average systolic value was 139 mmHg and average diastolic was 83 mmHg.

Examining Potential Confounders

Age was a potential confounder when comparing urban/rural and isolated/not isolated populations. The mean age for rural residents was 48.3 years and for urban residents was 42.5 years ($P<0.01$). Mean age for isolated residents was 50.8 years and not isolated was 42.8 years ($P<0.01$). Because increases in age are associated with increases in blood pressure, this can account for a portion of the variance in blood pressure between these two groupings (Chobanian et al. 2003).

Interestingly, systolic blood pressure differs across the lifecycle between men and women. Linear regressions were conducted using systolic blood pressure as the dependent variable and investigating the impact of age and sex. Results indicate that males have a higher average systolic blood pressure than females, however, the slope of increase in blood pressure with age is greater for females than it is for males. The coefficient for the interaction variable of sex and age for females is 0.94 ($P<0.01$). The coefficient for the interaction variable of sex and age for males is 0.71 ($P<0.01$). However, men still start with a higher average blood pressure as demonstrated by the coefficient of 18.77 for males. This phenomenon will be discussed in greater detail in the discussion section, but is consistent with the literature on the subject (Grady et al. 1992, Oparil 1995).

BMI, subscapular skinfold thickness, and waist circumference were also tested as potential confounders because of the association between these measures and blood pressure (Kannel et al. 1967, Stamler 1991, Schall 1995, Cooper et al. 1997, Gerber and Stern 1999, Kaufman et al. 1999). The mean difference in subscapular skinfold thickness and waist circumference was found to be statistically significant for the urban/rural grouping ($P<0.01$, $P<0.01$). For urban residents, mean subscapular skinfold thickness was 23.0 mm and waist circumference was 93.6 cm. For rural residents, mean subcapular skinfold thickness was 20.0 mm and waist circumference was 98.7 cm. When comparing the same measures of adiposity for the isolated/not isolated grouping, only mean difference in waist circumference was found to be statistically significant ($P<0.01$). The mean waist circumference for isolated residents was 101.0 cm and not isolated was 93.8 cm.

T-tests were also conducted on the sample to determine sex differences in blood pressure. The mean systolic blood pressure for men was 141 mmHg and for women was 131 mmHg ($P<0.01$). To determine the potential confounders for mean differences in blood pressure between the sexes, t-tests were ran for age, BMI, subscapular skinfold thickness, and waist circumference. Only subscapular skinfold thickness was found to be statistically significant ($P<0.01$). Women had a higher subscapular skinfold thickness (24.8 mm) than men (15.5 mm). While women had the higher mean values for this measure of adiposity, men demonstrated higher mean systolic blood pressure values.

Since three measures of adiposity were being used in the analysis, it was important to determine if one measure could mask the variance demonstrated by another measure. By conducting a Pearson correlation for BMI, waist circumference, and subscapular skinfold thickness, the association between these variables could be determined (see Table 6). Waist circumference and BMI were significantly correlated ($r=0.808$). Additionally, BMI and subscapular skinfold thickness were correlated ($r=0.740$). This indicates these measures were, to varying extents, interrelated. This comes as little surprise as the three variables are indications of a similar phenomenon (fatness).

Linear Regressions for Systolic Blood Pressure

When a linear regression was ran for systolic blood pressure as the dependent variable and sex, age, BMI, waist circumference, and subscapular skinfold thickness were held constant, the analysis shows 40.6% of the variance was explained by these independent variables. When examining the coefficients, sex accounted for the greatest amount of variance in systolic blood pressure ($\beta = 8.35$, $P<0.01$). This was expected because, in contrast to the other variables, sex is discrete and not continuous. The variable of age had a coefficient of 0.74 ($P<0.01$). This means for every year of life blood pressure will be expected to increase by 0.74 mmHg from the constant value of 47.82 mmHg. Therefore, while sex initially accounted for a greater percentage of the increase in blood pressure, continuous variables, such as age, can have a greater contribution across the lifecycle. Since all populations, with the exception of zero-slope societies, demonstrate an increase in mean systolic as the population ages, this comes as little surprise (Stamler et al. 1989).

The results of the other coefficients in this analysis were less clear. When the initial linear regression was conducted, the independent variables of age, sex, BMI, waist circumference, and subscapular skinfold thickness were all included. This provided the coefficients of 1.70 for BMI, 0.11 for waist circumference, and -0.06 for subscapular skinfold thickness. Only BMI was found to be statistically significant ($P<0.01$).

Since the Pearson correlation demonstrated a significant association between BMI and waist circumference, BMI and subscapular skinfold thickness, and waist circumference and subscapular skinfold thickness, linear regressions were run avoiding the inclusion of correlating variables. Another regression was conducted with the dependent variable of systolic blood pressure; results indicated sex, age, waist circumference, and subscapular skinfold thickness accounted for 38.5% of the variance in blood pressure. BMI is correlated with sex. Therefore, removing BMI had a significant impact on sex, increasing the coefficient to 12.05 (P<0.01). The values for age, waist circumference, and subscapular skinfold thickness were 0.75, 0.45, and 0.34, respectively. These values were all statistically significant (P<0.01, P<0.01, P<0.01). When a linear regression of systolic was conducted including only the variables of sex and BMI, these independent variables accounted for 21.7% of the variance in systolic blood pressure. BMI had a coefficient of 2.26 and sex was 10.20 (P<0.01).

Linear regressions were also conducted to determine the relative effect of anthropometric measures and environmental factors. In this analysis, the environmental factor being evaluated was residency. Systolic blood pressure was used as the dependent variable and a linear regression was conducted with age, sex, BMI, and urban/rural residence as independent variables (see Table 7). These variables accounted for 41% of the variance in systolic blood pressure. Sex, age, and BMI had coefficients of 9.47, 0.71, and 1.88, respectively (P<0.01). The coefficient for urban/rural residence was 6.32 (P<0.01). BMI was the only measure of adiposity used in the analysis. When a linear regression was conducted including age, sex, urban/rural residence, BMI, subscapular skinfold thickness, and waist circumference, BMI was the only measure of adiposity that was found to be statistically significant.

A linear regression was also conducted for systolic blood pressure with age, sex, BMI, and isolated/not isolated residency as the independent variables (see Table 7). These factors accounted for 41% of the variance in systolic blood pressure. The coefficients for sex, age, BMI, and isolated/not isolated residency were 9.29, 0.71, 1.81, and 6.80, respectively ($P<0.01$)

One element of the analysis that the above regression fails to demonstrate is the interaction between many of these variables. One interaction worth investigating is the impact of sex and residency status on systolic blood pressure. These variables have been investigated separately in previous regressions, but it is necessary to also test the interactions of these variables. A linear regression was conducted with systolic blood pressure as the dependent variable and sex, BMI, age, urban/rural residence, and the interaction term of urban/rural residence and sex. Results indicate that the interaction term of residence and sex was not significant when looking at the rural/urban grouping ($P=0.42$). This was also the case when the isolated/not isolated replaced the rural/urban variable in the regression. Again, the interaction term of isolated/not isolated and sex was not found to be significant ($P=0.23$). This means that the relationship between residence and sex does not have a significant impact upon systolic blood pressure for the individuals in this sample.

Another interaction term worth investigating is the relationship between BMI and sex and its effect upon systolic blood pressure. A linear regression was run with systolic as the dependent variable and sex, BMI, age, and the interaction term of BMI and sex. The interaction term of BMI and sex were not found to be significant ($P=0.10$). Linear regressions were also conducted using the interaction of waist circumference/sex and subscapular skinfold thickness/sex. Neither of these variables was found to be significant ($P=0.54$ and $P=0.54$). These results indicate that the relationship between these various measures of adiposity and sex does not have a significant affect upon systolic blood pressure of the individuals in this sample.

The final interaction worth investigating for systolic blood pressure is the relationship between the three measures of adiposity and residence and its effect on blood pressure. When the interaction terms of rural/urban residence and BMI were included in a linear regression for the dependent variable of systolic blood pressure, it was found the relationship between these two variables did not have a significant impact upon systolic blood pressure ($P=0.20$). This was also true when the interaction between isolated/not isolated residence and BMI was investigated ($P=0.50$). The results were also not significant for subscapular skinfold thickness and rural/urban or isolated/not isolated residence ($P=0.34$, $P=0.79$). The results were also not significant for waist circumference and rural/urban or isolated/not isolated residence ($P=0.80$, $P=0.30$).

Mean Values for Diastolic Blood Pressure

Diastolic blood pressure was also investigated in this analysis. T-tests were conducted for diastolic blood pressure using the same groupings of sex, rural/urban, and isolated/not isolated residence. The mean diastolic for men was 85 mmHg and for women was 80 mmHg ($P<0.01$). Interestingly, when tests were run for residence location using the two grouping variables, differences in diastolic blood pressure between rural and urban location were not found to be statistically significant ($P=0.60$). However, using isolated and not isolated as the grouping variable, a significant difference was demonstrated. The mean diastolic was 86 mmHg for isolated villages. The mean was 80 mmHg for not isolated villages ($P<0.01$).

Linear Regressions for Diastolic Blood Pressure

Linear regressions were conducted using diastolic blood pressure as the dependent variable and holding sex, age, BMI, waist circumference, and subscapular skinfold thickness constant. These independent variables accounted for 30.4% of the variance in diastolic blood pressure in the sample. The coefficient for sex was 5.22 and was statistically significant ($P<0.01$). Age had a coefficient value of 0.21 ($P<0.01$). BMI had a coefficient of 1.11 ($P<0.01$). Waist circumference, and subscapular skinfold thickness had coefficients of -0.02, and 0.08, respectively. None of these values were found to be statistically significant ($P=0.82$ and $P=0.39$). However, as with systolic blood pressure, BMI could be masking some of the variance demonstrated by these independent variables.

Linear regressions were also conducted for diastolic blood pressure with age, sex, BMI, and rural/urban residence as independent variables (see Table 8). Unlike the regression run for systolic blood pressure, rural/urban residence was not determined to account for a statistically significant portion of the variance ($P=0.85$). A linear regression was conducted for diastolic blood pressure and sex, age, BMI, and isolated/not isolated residency were used as independent variables (see Table 8). Isolated/not isolated residence was statistically significant when used as an independent variable in the linear regression ($P=0.02$). These four independent variables accounted for 31% of the variance in diastolic blood pressure. Sex, age, and BMI had coefficients of 4.51, 0.20, and 1.18, respectively ($P<0.01$). Isolated/not isolated residence had a coefficient of 3.17 ($P=0.02$).

Since a significant relationship between diastolic blood pressure and rural/urban residence did not exist, one would not expect that testing the interaction variable of rural/urban residency and sex would produce significant results. However, when the interaction of isolated/not isolated residency and sex were tested in a linear regression with diastolic as the dependent variable, the results were also not significant (P=0.45). The interaction of sex and the three measures of adiposity were also conducted using diastolic blood pressure as the dependent variable. For all three measures of adiposity, BMI, waist circumference, and subscapular skinfold thickness, there was not significant relationship with sex for diastolic blood pressure (P=0.56, P=0.75, P=0.23). These results are consistent with the results for systolic blood pressure.

Summary of Statistical Analysis

There are several important findings revealed in the statistical analysis that are necessary to highlight before a discussion of the results. First, mean systolic and diastolic blood pressure values are higher for rural and isolated residents than their urban and not isolated counterparts. The mean blood pressure value for rural residents was 141/82 mmHg and 131/81 mmHg for urban residents. The mean blood pressure value for isolated residents was 146/86 mmHg and for not isolated residents the value was 132/80 mmHg. Additionally, mean values for men were higher than for women (141/85 mmHg, 131/80 mmHg).

Age and three measures of adiposity were evaluated to determine their role as potential confounders. Rural and isolated populations were significantly older than their urban and not isolated counterparts (see Tables 3 and 4). Difference in mean age between men and women was not statistically significant (see Table 5). As for the three measures of adiposity, less clear results were demonstrated. Urban residents had higher mean subscapular skinfold thickness values, but smaller mean waist circumference. Isolated residents had greater mean waist circumference than not isolated residents, but there was no statistically significant difference for the other measures of adiposity. For men and women, the only statistically significant measure of adiposity was subscapular skinfold thickness, and women exhibited a higher mean value. The following discussion section will offer insights into the significance of the above results.

CHAPTER 4

DISCUSSION

Residence and Culture Change

The results of the analysis of diastolic and systolic blood pressure in seven villages in Yakutia reveal some interesting findings. Residency status has a significant influence on systolic and, to a lesser extent, diastolic blood pressure. Figure 1 outlines the variation between the seven different locations. Interestingly, it appears individuals residing in a rural residence have a mean systolic blood pressure that is 10 mmHg higher than their urban counterparts. The linear regressions conducted also demonstrate that residency accounted for a significant portion of the variation in systolic and, to a lesser extent, diastolic blood pressure. An increase in systolic blood pressure was attributed to residence in a rural location (β=6.32). This was also demonstrated for residence in an isolated location (β=6.80). For diastolic blood pressure, urban/rural residency was not found to account for a significant portion of the variance. However, when residency was grouped as isolated/not isolated, residence in an isolated location accounted for a statistically significant portion of the variance in diastolic blood pressure (β=3.17).

It is important to note that the classifications of rural/urban and isolated/not isolated provide a great deal of overlap in regards to the villages grouped by these two variables. In fact, Dikimdye is the only village that changes groupings when using the two criteria. This is because Dikimdye meets the established definition for being rural (the population is only 850 individuals), but does not meet the criteria for being isolated (it is near an administrative center). The purpose of including both of these grouping variables in this analysis is to reinforce that the phenomenon occurring with blood pressure in more traditional villages is seen when we use two different criteria to establish these groups.

It is important to take a moment to analyze the difference in blood pressure values between rural and isolated populations. Remember that the three rural populations are Dikimdye, Asyma, and Khorobut. The villages classified as isolated are Asyma and Khorobut. What impact does the removal of Dikimdye have on blood pressure values? It appears that mean systolic blood pressure increases when Dikimdye is removed from the isolated grouping. Mean systolic blood pressure for rural residents was 141 mmHg. For isolated residence, the mean blood pressure value was 146 mmHg. There was no statistically significant difference between diastolic blood pressure values for the rural/urban grouping (rural= 82 mmHg, urban= 81 mmHg). However, isolated residents had a mean diastolic blood pressure value of 86 mmHg, compared to 80 mmHg for not isolated residents. The removal of Dikimdye had an adverse affect on blood pressure values for isolated populations. To better understand what is occurring, it is necessary to more closely evaluate the characteristics of Dikimdye. A successful herding and agricultural community, Dikimdye has won several Republic-wide awards for competitions in productivity. Nicely managed gardens and thriving herds characterize the village. The characteristics of this village serve to further validate the assertions made in this paper; the changes occurring in Siberia defy typical models of modernization. It is those that reside in more productive and less traditional communities that exhibit better blood pressure values.

There were significant differences in blood pressure between the sexes when evaluating the grouping variables for residence. Men in both rural and urban locations had a higher average systolic and diastolic blood pressure values than their female counterparts. Men in rural locations had the highest mean blood pressure with a value of 149/88 mmHg. This places the average for men in these locations in the hypertensive range. What is it about the experience of rural living, particularly for men, that increases blood pressure values so significantly?

When developing a theoretical framework for the process of culture change experienced by the Yakut, it was stated that modernization could not be conceptualized in the same way it has been in other locations because all individuals experienced changes associated with the collapse of communism, not solely those who chose to adopt a more modern, urban lifestyle. Generally, one would predict that residence in a more urban location would result in higher blood pressure values because of a decrease in physical exercise, increased consumption of fatty foods, and/or increased stress. However, the results from this data set indicate the opposite phenomenon is occurring. This was confirmed by the higher mean systolic and diastolic blood pressure values of individuals living in rural and isolated residences. It is now important to investigate what about residing in a rural/isolated location makes blood pressure values higher.

It was also important to determine if potential confounders exist between the populations in urban/rural and isolated/not isolated residences. Several t-tests were conducted to determine this. Statistically significant differences between the mean ages of rural and urban subjects, and between isolated and not isolated subjects, were found. The mean age for rural residence was 48.3 years and for urban residence was 42.5 years ($P<0.01$).

Mean age in isolated communities was 50.8 years and for not isolated was 42.8 years ($P<0.01$). It is anticipated the populations with higher systolic and diastolic blood pressure are older because blood pressure typically increases with age (Chobanian et al. 2003). Therefore, a portion of the higher mean values in rural/isolated residences can be accounted for by the fact that the populations in these residences are older than the population residing in urban/not isolated residences. However, this cannot account for all the variance witnessed between populations in these two groupings.

Using residency status as a means to determine differences in blood pressure has been confirmed by other studies, but with different results. Joan I. Schall (1995) offers an analysis of sex differences in blood pressure as a result of acculturation in Papua New Guinea. Schall employs the term modernization in her study; however, the components of this analysis include education level, use of non-native language (English), and participation in non-subsistence employment can be used as measures of both acculturation and modernization. Among Manus men, blood pressure increases depending on residency status in villages, towns, or cities. Male average systolic blood pressure was 115 mmHg, 125 mmHg, and 129 mmHg, respectively. This trend was not demonstrated among women, where town residents had the highest average blood pressure (118/75 mmHg compared to 112/71 mmHg in villages).

It appears from Schall's study that men and women experience residency status differently. Women with hypertension were not more likely to be employed outside the home and had no greater education than normotensive women. In fact, hypertension among women was most strongly associated with age. Among men, in addition to occupation and education-level, body mass and adiposity measure were most associated with blood pressure.

This indicates men and women experience culture change differently. Even in situations where women are working outside the home in the economic sector, one does not see a correlation between occupation and blood pressure. Perhaps this can be attributed to distinctions in gender roles; however, Schall provides no evidence to validate this assertion.

Schall's use of residency status as the primary unit of analysis might mask some of the heterogeneity within these different locations. Residency in a city does not necessarily mean an individual has adopted a more modern lifestyle or participates more frequently in the market than an individual who resides in a village. The threat of the ecological fallacy is inherent in this type of model. The ecological fallacy means that, "an association observed between variables on an aggregate level does not necessarily represent the association that exists at the individual level" (Last 1995). However, using residency status to compare groups of individuals does allow the researcher to make certain generalizations about differences in lifestyle, and therefore differences in health status, between groups of people. In the study of the Yakut, the use of residency as the primary means of analysis is subject to the same potential errors. While there will be heterogeneity in behavior among individuals within these different locations, this model still offers a strong preliminary analysis of the impact of culture change on the Yakut population.

In the analysis, the relationship between various measures of adiposity and residence was investigated for its potential impact on blood pressure. If individuals residing in rural/isolated villages had significantly higher BMI values, this could give us some indication of why blood pressure values were so much greater in these locations. However, for all three measures of adiposity (BMI, waist circumference, and subscapular skinfold thickness) and residence, there was no significant difference demonstrated in relation to blood pressure.

This means that populations residing in rural and isolated locations are not significantly fatter than those in urban/not isolated communities and the interaction of residence and adiposity measures does not have a significant effect upon systolic blood pressure.

One can only postulate as to why mean blood pressure values are higher in rural/isolated locations, particularly among men. It has been demonstrated that these populations are older than their urban counterparts, but this cannot account for all the variation. There are not significant differences in the three adiposity measures, meaning that rural/isolated residents are not fatter than their urban/not isolated counterparts. It is possible that rural/isolated residents may consume more sodium than urban/not isolated residents. There is a clear relationship between amount of sodium consumed in the diet and blood pressure values (Stevenson 1999). It is conceivable that individuals in rural and isolated communities do not have comparable access to the market and fresh foodstuff as urban/not isolated residents. It is possible salt is used as a preservative for food because of inconsistent or infrequent access to the market. It is also possible individuals in the urban/not isolated residences are more physically active than rural/isolated residents. While no great differences in adiposity were demonstrated between these populations, physical exercise can strengthen the heart and blood vessels and decrease blood pressure (Spiegelman et al. 1992). Since the populations were comparable in regards to fatness, physical activity could be a factor that impacts urban/not isolated residents blood pressure in a positive way.

Another potential factor for the greater mean blood pressure in rural/isolated residents could be the consumption of alcohol. It has been demonstrated that alcohol consumption can increase blood pressure values (Stamler et al. 1989). While there is no data on the drinking behavior among the Yakut available to verify this assertion, it is conceivable that individuals residing in rural/isolated locations may consume more alcohol than their urban/not isolated counterparts. This could be the result of boredom or depression associated with living in a rural/isolated location.

Just as in Schall's study, there were sex differences in blood pressure for the Yakut population. This indicates that behavior differs between the sexes in both rural/isolated and urban/not isolated locations to result in higher average blood pressure values for men. There is no statistically significant difference in age between the sexes, so this cannot account for the greater blood pressure values in males. BMI and waist circumference differences were also not found to be statistically significant. It is possible that diet and activity level varies between men and women. Men in rural/isolated locations, with the highest mean blood pressure values, could be the least physically active and consume the greatest amount of sodium in their diet.

The differences in residency status in Schall's study (1995) indicated that populations classified as more modern were subject to the greatest increases in blood pressure. Among the Yakut, those residing in isolated, rural communities exhibited the highest mean blood pressure. This demonstrates that the process of decollectivization that occurred in Siberia has resulted in unique consequences for residents.

Adiposity and Blood Pressure

To determine if there were significant differences in the characteristics of individuals residing in different locations in Yakutia, t-tests were run for various measures of adiposity used in the linear regressions. BMI values are not significantly different between populations in rural/urban or isolated/not isolated groupings. However, differences in waist circumference and subscapular skinfold thickness were statistically significant between urban and rural residents, but not for isolated versus not isolated populations. The mean subscapular skinfold thickness for rural populations was 20.0 mm and for urban residents was 23.0 mm ($P<0.01$). Waist circumference was significantly different for both groupings. Rural residents have a mean waist circumference of 98.7 cm and urban residents have a mean of 93.6 cm ($P<0.01$). Thus, certain measures of adiposity were different between the two populations; however, the difference was not clear in all measures of adiposity. This observation is reinforced by the linear regressions conducted for systolic blood pressure, which indicated that the interaction of residence and the three measures of adiposity did not have a significant effect upon blood pressure. This indicates other factors were also contributing to higher mean blood pressure in rural and isolated populations.

When evaluating the measures of adiposity gathered for the Yakut at various residence locations, it is important to highlight that Siberian populations as a whole are uniquely adapted to the extreme environment where they reside. The Yakut reside in a climate where the mean temperature is –10.3°C. July is the warmest month with an average temperature of +18.7°C. In January, the coldest month, the mean temperature is –43.2°C (Ermakov et al. 2002). This makes the Sakha (Yakutia) Republic one of the coldest habitable environments on the planet, with extreme variations in temperature. In the study of a population's blood pressure, it would be remiss not to discuss possible adaptations of the Yakut to this subarctic climate.

Human populations exhibit variation in body size and body mass in relation to climate. Limb length reflects adaptation to climate and varies in relation to temperature in modern human populations (Hanna 1999). In arctic environments, populations have shorter limbs and wider bodies as a means to reduce the surface area to body mass ratio. The trends of increased body mass, shorter limbs, and wider bodies results in higher average BMI for arctic populations. Despite a higher average BMI, arctic populations do not exhibit the same increases in skinfold thickness in relation to BMI that is seen in US populations (Ruff 2002). Therefore, while a relationship between BMI and blood pressure will be demonstrated in the Yakut population, average BMI could be higher without any negative health consequences.

A brief discussion of the potential fallacies of using BMI measures is warranted. BMI is a measure of weight for height (kg/m^2). The World Health Organization (WHO) establishes the guidelines for BMI in regards to underweight (below 18.5), overweight (between 25.0 and 29.9), and obese (greater than 30.0). While BMI is an important and widely used diagnostic tool, it is not without its shortcomings. Recent studies suggest different populations may exhibit poor health outcomes at different measures of BMI (WHO 2004). In a study of BMI in Asian populations, the WHO found lower BMI values reflect a higher percentage of body fat than is seen in European populations. This variation is also witnessed within populations and can be attributed to environmental and physiological factors (WHO 2004). The WHO recognizes the shortcomings of these measures in regards to certain populations; however, redefinition of BMI cut-off points was determined to be unnecessary. Since indigenous Siberians have a body type that resembles other arctic populations as a result of genetic and physiological adaptations, it is important to view the BMI values within this population with an understanding of the limited utility of the measurements themselves.

Sex Differences in Blood Pressure

The dramatic difference in blood pressure between the sexes is an important element of this analysis (see Table 5 and Figure 2). One assertion in this paper is that differences in blood pressure can be attributed in part to differences in the socially constructed roles of men and women in society. Male systolic blood pressure was 141 mmHg and female was 131 mmHg. Both values are above JNC-7 recommended values for systolic blood pressure (Chobanian et al. 2003). The mean for women is in the pre-hypertensive range and the mean for men is considered hypertensive. Therefore, the sample of the Yakut in this analysis have blood pressure values which put them at greater risk for certain cardiovascular diseases, including stroke, ischemic heart disease, and heart attack.

Additionally, there are sex differences in blood pressure values by residence location. Men in rural/isolated villages have higher blood pressure values than women in these locations. Additionally, men in urban/not isolated towns have higher blood pressure values than women, although these averages are lower than what is seen in rural/isolated residences. This indicates that the phenomenon of blood pressure differences between the sexes exists regardless of residence locale. Therefore, the factors that are affecting blood pressure values for men are occurring for the entire sample population. So, what are the potential factors?

Since the difference in blood pressure between men and women is large, it is important to examine the characteristics of the sample population. There is no statistically significant difference in age between the sexes in the sample. Therefore, the increased systolic and diastolic blood pressure values of men cannot be attributed to a skewed sample of older males. Additionally, differences in BMI and waist circumference between the sexes were also not found to be statistically significant. A review of the literature demonstrates adiposity measures and blood pressure are highly correlated (Kannel et al. 1967, Stamler 1991, Gerber and Stern 1999, Schall 1995, Kaufman et al.1999, Cooper et al. 1997). A discussion of biological differences between the sexes contributing to differences in blood pressure is warranted.

One significant biological difference between men and women is the distribution and percentage of adipose tissue. Among men in developed nations, the average percentage of total body weight composed of adipose tissue is ~15% (Brown and Konner 1987). For women, the percentage is ~27% (Brown and Konner 1987). The relationship between adiposity measures and blood pressure is strongly correlated (Kannel et al. 1967, Stamler 1991, Gerber and Stern 1999, Schall 1995, Kaufman et al.1999, Cooper et al. 1997). In fact, Body Mass Index (BMI) has been determined to be one of the strongest factors associated with hypertension (Spiegelman et al. 1992, Gerber and Stern 1999). It would stand to reason that women, with a higher percentage of body fat, would also have higher rates of hypertension. However, this does not appear to be the case.

While hypertension rates and adiposity measures are strongly correlated for both men and women when evaluated separately, there appears to be no significant association between the sexes in relation to adipose tissue and hypertension rates (Folsom et al. 1991, Gerber et al. 1995). Some of this might be accounted for in the distinctions between men and women in the distribution of body fat. Men generally follow the android pattern of fat distribution-fat primarily deposited around the mid-section and chest. Women typically demonstrate the gynoid pattern where adipose tissue is distributed around the waist and hip area (Newell-Morris 1995). Because fat distribution around the mid-section has been associated with an elevated risk for cardiovascular disease, it appears women may have to gain a relatively larger percentage of fat than men to be placed in the same risk category for CVD (Newell-Morris 1995, Weinsier 1985). This helps to explain that, while women have a greater percentage of fat than men, the distribution of adipose tissue is important in determining effects on an individual's health status. This highlights the importance of evaluating, not just sex-specific distinctions in BMI, but also the distribution of adipose tissue when determining risk factors for hypertension and CVD.

Women typically have higher mean percentage body fat than men, but a significant increase in blood pressure values is not associated with this higher percentage. This phenomenon is witnessed in the sample of Yakut men and women. There was a statistically significant difference in subscapular skinfold thickness between men and women. Women had a mean value of 24.8 mm and the mean value for men was 15.5 mm ($P<0.01$). These values further substantiate the argument that various measures of adiposity are not associated with increases in blood pressure when comparing the sexes.

Another factor that may impact blood pressure values between the sexes is diet. A diet high in sodium is associated with increases in blood pressure (Stevenson 1999). It is possible that men consume a greater amount of salt in their diet than females. Additionally, alcohol can increase blood pressure levels (Stamler 1989). It is likely that Yakut men are consuming a greater amount of alcohol than women, which could potentially increase their blood pressure values.

It is also important to note that psychosocial stress may contribute to the greater mean blood pressure value in men than in women. Schall (1995) and Dressler and Bindon (1997, 2000) spend extensive time in their research outlining how the experiences of the men and women in Papua New Guinea and American Samoa are distinctly different. Men strive to achieve different goals than women and have established different markers of achievement. In Yakutia, it is possible men have experienced the stress of decollectivization more acutely than females. In this society, men are the primary providers in the family and women may help to supplement the household income by selling berries, mushrooms, or pine nuts on the side of the road. Because the burden of providing the primary means of subsistence is placed on the males, they may experience higher levels of stress than females.

Adopting a Lifecycle Perspective

The mean age of women in the sample was 44.1 years and the mean age for men was 45.3 years. By adopting a lifecycle perspective of the current blood pressure values, it could be posited that women will experience a greater increase later in the life, around 60 years of age and after menopause (Grady et al. 1992, Oparil 1995). Researchers have attempted to make certain generalizations regarding the characteristics of blood pressure across the lifecycle. The increase of blood pressure associated with age was cited as one of the most pressing issues to be addressed in the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (1997). The exceptions to this rule are known ‘zero-slope’ societies. The Yanomamo and Xingu of Brazil and samples from Papua New Guinea and Kenya do not exhibit this trend with age. These findings are from the INTERSALT study which also found these populations exhibited low sodium excretion and low BMI values. However, BMI was still positively correlated with blood pressure in these populations (Stevenson 1999). The existence of ‘zero-slope’ societies indicates hypertension is a phenomenon closely tied to the physical and social environment.

In addition to the general increase in blood pressure with age exhibited in most populations, there are periods in the lifecycle when blood pressure increases more markedly than others. Obviously, these trends are contingent upon individual behavior and can be altered by behavioral modifications that either positively or negatively affect blood pressure. In general, there is a sharp elevation of blood pressure from birth to age five. At this point, blood pressure remains static until the onset of puberty, which is generally associated with an increase in blood pressure (Beckett et al. 1992). This is where sexual distinctions in blood pressure can be highlighted. Among females, the onset of puberty begins an average of two years earlier than males. Therefore, females tend to reach their adult blood pressure levels earlier than boys. Individuals with higher BMI values typically begin puberty earlier than their peers. Increased BMI in these individuals leads to higher blood pressure values and earlier sexual maturation. However, blood pressure and age of sexual maturity are not directly related (Daniels et al. 1996). Understanding this pattern among adolescents can serve as a useful predictive tool. For females, blood pressure between 11 and 15 years is a good indication of adult average blood pressure. Among males, average adult blood pressure can be predicted between the ages of 13 and 17 (Gerber and Stern 1999). This understanding can be useful to clinicians on an individual basis and for researchers making population-level predictions. However, individual behavior across the lifecycle can dramatically alter blood pressure towards higher or lower values, depending on factors such as diet, physical activity level, and stress levels.

In addition to trends seen early in the lifecycle, predictions can also be made in relation to blood pressure values later in life. Among males, the slope of blood pressure values is consistent with age across the lifecycle. For females, the greatest increase is seen after the age of 62. The slope of increase after 62 years of age among women is greater than at any other stage of life and greater than for men at any age. Some researchers attribute the sharp increase for women late in the lifecycle to menopause (Grady et al. 1992); however, there is no evidence estrogen serves as a protective factor against increases in blood pressure (Gerber and Stern 1999). This marked trend among females late in life is significant because figures indicate that 67.5% of females over the age of 65 years will be diagnosed as hypertensive (Oparil 1995). As discussed previously, this puts women at greater risk for cardiovascular diseases late in the lifecycle.

The biological framework outlined above helps to create a better understanding of the relationship between adiposity measures and blood pressure in the Yakut. Both sexes demonstrate a strong relationship between BMI and blood pressure; however, women's percentage of body fat will be greater before increases in blood pressure are demonstrated. Additionally, it can be anticipated that women will see the greatest rise in blood pressure around 62 years of age. Therefore, women with hypertension prior to reaching menopause may be at greater risk for CVD and other complications associated with hypertension as they age. These observations are consistent with the results from the data set of the Yakut. Men have a higher average blood pressure, but the slope of increase in blood pressure with age was greater for women than for men (see Results section).

Future Research: Stress, the Elusive Variable

One possible contributing factor to the rise in blood pressure among rural and isolated residents is an increase in psychosocial stress when compared to their urban and not isolated counterparts. Typically, researchers have argued the experience of living in a modern environment is more stressful than a more traditional lifestyle (Dressler 1999). However, these models do not account for the experience of individuals when the entire political, economic, and social structure collapses. Individuals in a rural environment might experience higher levels of stress due to issues ranging from land rights and land usage to unfair division of the collective farms. One interesting theory notes the change in worldview experienced by people in the Russian Federation as a whole (Piko 2004). While the Soviet system was somewhat artificial in its conception of a collective identity, individuals still shaped their understanding of self and community in relation to this collective principal. After the introduction of the capitalist system, individuals had to abandon a collective identity and embrace a more individualistic worldview. It is possible those residing in a more rural community are more reticent to abandon these past ideas and therefore experience profound stress as the world is changing around them.

Additionally, it might be fruitful to pursue further studies in Yakutia implementing the cultural consonance model outlined by Dressler and Bindon (2000). This model arose from the objective of understanding the pathways through which social integration and higher socioeconomic status result in lower disease risk. Cultural consonance can be described as the degree to which an individual sees his or her actions within the context of culturally prescribed standards of behavior. These cultural standards of behavior are determined through the consensus model, in which a majority of responses to questions of cultural norms indicate individuals within the population all subscribe to the same cultural model.

The marked social and economic change in Yakutia may have resulted in a changing perception of cultural consensus. As a result, there is a strong likelihood of low cultural consonance as the model itself is changing and people are experiencing increased uncertainty in the face of a new social and economic environment. It is also possible that individuals in urban environments are achieving a lifestyle similar to the desired model. As a consequence, individuals in rural areas may experience profound stress from a relative lack of achievement. More research is needed in this area to determine the legitimacy of these assertions.

Conclusions

Since blood pressure is affected by both biological and cultural factors, it is not possible to identify a single variable as being the primary cause of increase. Rather, one has to develop a holistic approach when investigating blood pressure. By identifying many potential factors contributing to the high rates of hypertension in Yakutia, policies can be adopted to target the issue broadly. This analysis reveals that individuals residing in rural and isolated residences have higher mean blood pressure values than their urban and not isolated counterparts. This reinforces the notion that the changes following decollectivization have to be conceptualized differently than traditional theories of modernization. Life in these rural and isolated communities may result in a high sodium diet and little physical activity. It could also be that living in these communities is a more stressful experience than life in urbanized towns. Additionally, men appear to have consistently higher blood pressure values than women. Reasons for the increased mean blood pressure in males has been posited within this paper (diet, physical activity levels, alcohol, stress), however, more research is needed to determine what aspect of the lifestyle of Yakut men contribute to this increase in blood pressure.

The transition of indigenous populations to life after decollectivization has been difficult. It is necessary for researchers to draw increasing attention to the health problems experienced by these populations so policymakers will respond in turn. Because this area was inaccessible for the long period of Soviet rule, it is important for research to continue in this region of the world, as there are many critical issues that need to be addressed.

Table 1. Overview of sample means from three rural villages in Yakutia

Village Location	**Dikimdye**		**Asyma**		**Khorobut**	
Mean values (standard dev.)	*Male, n=15*	*Female, n=42*	*Male, n=9*	*Female, n=22*	*Male, n=19*	*Female, n=40*
age (yr)	49.6 (8.8)	42.5 (8.4)	49.7 (11.1)	49.8 (12.5)	53.6 (16.5)	50.3 (18.4)
weight (kg)	62.8 (8.8)	54.6 (8.4)	70.4 (10.0)	61.9 (14.7)	71.0 (16.0)	57.8 (14.2)
height (cm)	162.7 (5.9)	155.0 (5.9)	165.0 (3.8)	153.6 (7.0)	161.9 (8.2)	152.2 (7.8)
BMI (kg/m^2)	23.7 (2.6)	22.8 (3.6)	25.9 (3.9)	26.2 (6.2)	26.9 (4.5)	24.8 (5.3)
subscap skinfold (mm)	13.5 (4.4)	17.9 (6.9)	14.3 (7.0)	25.7 (13.0)	19.4 (10.2)	23.0 (10.9)
diastolic b.p. (mmHg)	80 (5)	74 (12)	92 (16)	85 (11)	91 (15)	83 (15)
systolic b.p (mmHg)	146 (14)	128 (24)	146 (21)	141 (26)	154 (26)	144 (27)
waist circum. (cm)	94.5 (5.8)	95.1 (7.8)	98.7 (4.9)	102.3 (10.7)	103.1 (8.0)	99.9 (10.9)

Table 2. Overview of mean values for samples in urbanized towns in Yakutia

Village Location	**Berdygestiakh**		**Maia**		**Nizhny Bestiakh**		**Tiungiuliu**	
Mean values (standard dev.)	*Male, n=28*	*Female, n=38*	*Male, n=15*	*Female, n=27*	*Male, n=11*	*Female, n=24*	*Male, n=34*	*Female, n=105*
Age (yr)	44.6 (12.4)	38.0 (12.4)	42.4 (17.2)	49.6 (13.1)	36.2 (15.9)	42.5 (9.4)	42.3 (17.6)	42.4 (14.5)
weight (kg)	69.7 (14.7)	60.1 (11.8)	66.7 (6.5)	62.2 (15.2)	68.0 (19.8)	68.9 (19.0)	64.5 (12.6)	59.1 (12.0)
height (cm)	164.1 (8.1)	155.1 (5.5)	166.4 (6.1)	152.5 (7.5)	166.2 (8.0)	158.1 (6.8)	164.2 (5.6)	153.9 (6.1)
BMI (kg/m^2)	26.0 (6.0)	24.9 (4.4)	24.1 (2.3)	26.7 (6.0)	24.4 (6.3)	27.3 (6.2)	23.9 (4.1)	24.9 (4.9)
subscap skinfold (mm)	15.5 (8.3)	24.3 (10.5)	12.0 (4.7)	27.9 (10.3)	15.1 (7.3)	26.7 (14.2)	16.3 (9.5)	27.2 (11.3)
diastolic b.p. (mmHg)	84 (18)	80 (12)	84 (11)	87 (13)	86 (14)	82 (13)	82 (12)	79 (14)
systolic b.p (mmHg)	141 (32)	127 (21)	135 (22)	146 (27)	137 (26)	132 (22)	135 (20)	123 (26)
waist circum. (cm)	100.3 (10.6)	97.8 (8.7)	98.7 (4.5)	103.7 (11.0)	95.8 (9.8)	103.6 (13.0)	83.9 (11.5)	87.4 (13.2)

Table 3. Independent samples t-tests for key variables for rural and urban residents

	Rural	Urban	Significance (P-value)
age	48.3	42.5	0.000
BMI	24.7	25.2	0.270
subscapular skinfold thickness	20.0	23.0	0.007
diastolic blood pressure	82.0	81.0	0.604
systolic blood pressure	141.0	131.0	0.000
waist circumference	98.7	93.6	0.000

Table 4. Independent samples t-tests for key variables for isolated and not isolated residents

	Isolated	Not Isolated	Significance (P-value)
age	50.8	42.8	0.000
BMI	25.7	24.8	0.147
subscapular skinfold thickness	22.0	22.0	0.977
diastolic blood pressure	86.0	80.0	0.000
systolic blood pressure	146.0	132.0	0.000
waist circumference	101.0	93.8	0.000

Table 5. Independent samples t-tests for key variables for men and women

	Men	Women	Significance (P-value)
age	45.3	44.1	0.464
BMI	24.9	25.1	0.830
subscapular skinfold thickness	15.5	24.8	0.000
diastolic blood pressure	84.8	80.2	0.001
systolic blood pressure	141.0	131.0	0.000
waist circumference	95.1	95.5	0.772

Table 6. Pearson correlations for measures of adiposity

	BMI	subscapular skinfold	waist circumference
BMI	1.000	0.740	0.808
subscapular skinfold	0.740	1.000	0.561
waist circumference	0.808	0.561	1.000

Table 7. Linear regressions using systolic blood pressure as the dependent variable

	Standardized Coefficient		
	β	*t*	Significance
Sex	9.47	4.48	0.000
Age	0.71	10.55	0.000
BMI	1.88	9.42	0.000
Urban/rural residence	6.32	3.01	0.003

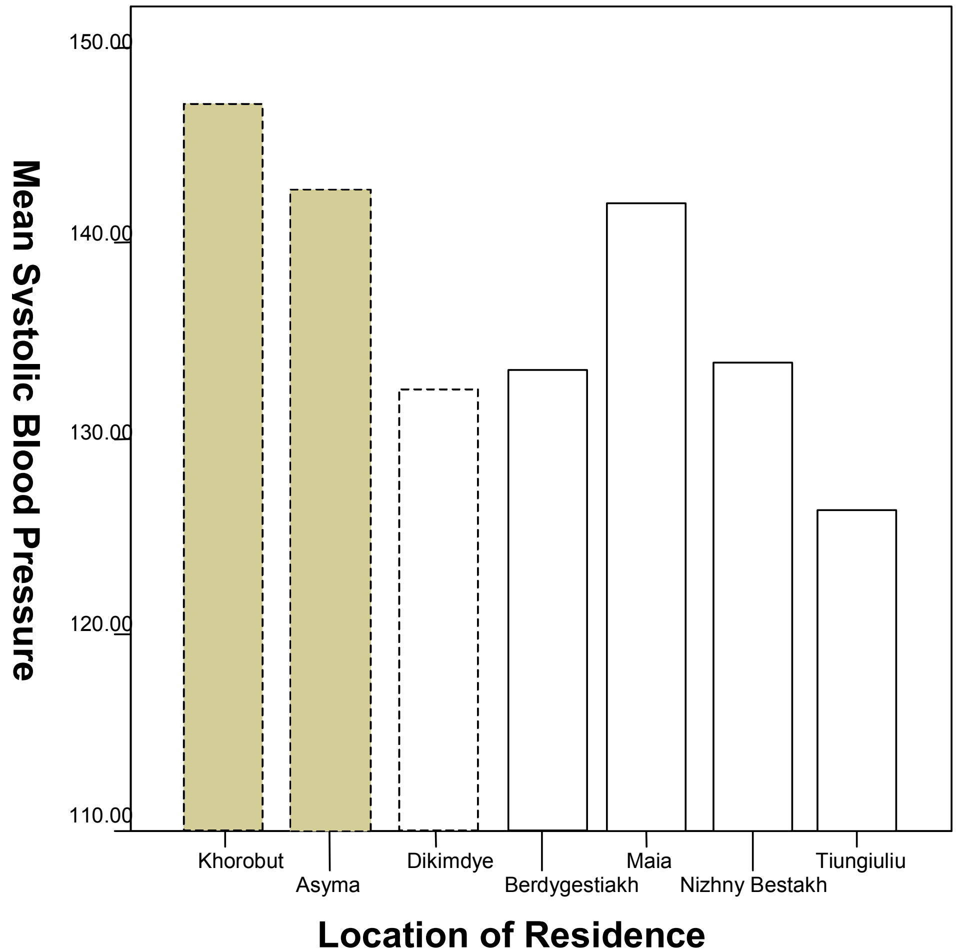
	Standardized Coefficient		
	β	*t*	Significance
Sex	9.29	4.39	0.000
Age	0.71	10.54	0.000
BMI	1.81	9.08	0.000
Isolated/not isolated	6.80	2.77	0.006

Table 8. Linear regressions using diastolic blood pressure as the dependent variable

	Standardized Coefficient		
	β	*t*	Significance
Sex	4.51	3.70	0.000
Age	0.21	5.54	0.000
BMI	1.19	10.36	0.000
Urban/rural residence	0.23	0.19	0.848

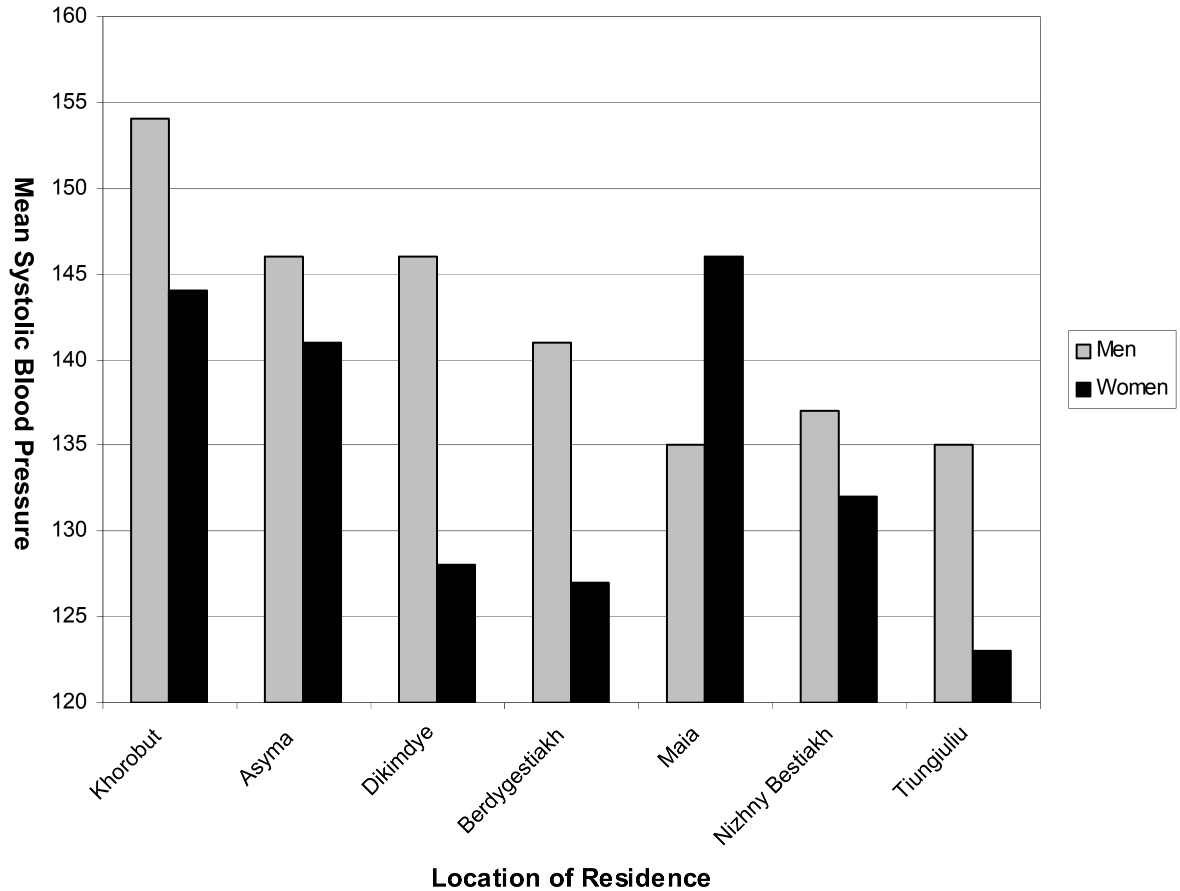
	Standardized Coefficient		
	β	*t*	Significance
Sex	4.51	3.72	0.000
Age	0.20	5.13	0.000
BMI	1.18	10.38	0.000
Isolated/not isolated	3.17	2.26	0.024

Figure 1. Mean systolic blood pressure by residence location



<u>Grouping Variables for the Villages:</u>
Rural: Dashed Border
Urban: Solid Border
Isolated: Gray Bar
Not Isolated: White Bar

Figure 2. Mean systolic blood pressure by sex and residence location



REFERENCES

Anderson DG. 2000. Identity and ecology in arctic Siberia. Oxford: Oxford University Press.

Baker PT. 1986. Rationale and research design. In: Baker PT, Hanna JM, Baker TS, editors. The changing Samoans: Behavior and health in transition. Oxford: Oxford University Press. p 3-18.

Baker PT, Hanna JM, Baker TS. 1986. The changing Samoans: Behavior and health in transition. Oxford: Oxford University Press.

Baker PT. 1997. The eternal triangle: Genes, phenotype, and environment. American Journal of Human Biology 9:93-101.

Beckett LA, Rosner B, Roche AF. 1992. Serial changes in blood pressure from adolescence into adulthood. American Journal of Epidemiology 135:1166-1177.

Berry JW. 1984. Acculturation and mental health among circumpolar peoples. In: Fortuine R, editor. Circumpolar health 1984. Proceedings of the Sixth International Symposium on Circumpolar Health. Seattle: University of Washington Press. p 305-312.

Brown DE. 1982. Physiological stress and culture change in a group of Filipino-Americans: a preliminary investigation. Annual Review of Human Biology 9:553-563.

Brown PJ, Konner M. 1987. An anthropological perspective on obesity. Annals of the New York Academy of Sciences 499:29-46.

Chobanian AV, Bakris GL, Black HR, Cushman WC, et al. 2003. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Journal of the American Medical Association 289(19):2560-2572.

Cooper R, Rotimi C, Ataman S, et al. 1997. The prevalence of hypertension in seven populations of West African origin. American Journal of Public Health 87(2):160-168.

Daniels SR, Obarzanek E, Barton BA. 1996. Sexual maturation and racial differences in blood pressure in girls: The National Heart, Lung, and Blood Institute Growth and Health Study. Journal of Pediatrics 129:208-213.

Dressler WW. 1995. Modeling biocultural interactions in anthropological research: An example from research on stress and cardiovascular disease. Yearbook of Physical Anthropology 38:27-56.

Dressler WW, Bindon JR. 1997. Social status, social context, and arterial blood pressure. American Journal of Physical Anthropology 102:55-66.

Dressler WW. 1999. Modernization, Stress, and Blood Pressure: New Directions in Research. Human Biology 71(4):583-606.

Dressler WW, Bindon JR. 2000. The health consequences of cultural consonance: cultural dimensions of lifestyle, social support, and arterial blood pressure in an African American community. American Anthropologist 102(2):244-260.

Dyer AR, Elliott P, Shipley M. 1990. Body mass index versus height and weight in relation to blood pressure. American Journal of Epidemiology 131:589-596.

Ermakov E, Cherosov M, Praskovia G. 2002. Classification of ultracontinental boreal forest in Central Yakutia. Folia Geobotanica 37:419-440

Folsom AR, Burke GL, Byers CL et al. 1991 Implications of obesity for cardiovascular diseases in Blacks: The CARDIA and ARIC studies. American Journal of Clinical Nutrition 53:1604-1611S.

Forsyth J. 1992. A history of the peoples of Siberia: Russia's North Asian colony 1581-1990. Cambridge: Cambridge University Press.

Gerber LM, Stern PM. 1999. Relationship of body size and body mass to blood pressure: sex-specific and developmental influences. Human Biology 71:505-530.

Gerber LM, Schwartz JE, Schnall PL, Pickering TG. 1995. Body fat and fat distribution in relation to sex differences in blood pressure. American Journal of Human Biology 7:173-182.

Grady D, Rubin SM, Petitti DB. 1992. Hormone therapy to prevent disease and prolong life in postmenopausal women. Annals of Internal Medicine 117:1016-1037.

Hanna JM. 1999. Climate, Altitude, and Blood Pressure. Human Biology 71(4):553-585.
Holm H, Sorensen G. 1995. Whose world order? Uneven globalization and the end of the Cold War. Boulder, CO, Oxford: Westview.

Hutchinson J, Byard PJ. 1987. Family resemblance for anthropometric and blood pressure measurements in Black Carib and Creoles from St. Vincent Island. American Journal of Physical Anthropology 73:33-39.

Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 1997. The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Archives of Internal Medicine 157:2413-2446.

Kannel WB, Hjortland MC, McNamara PM et al. 1976. Menopause and the risk of cardiovascular disease: The Framingham study. Annals of Internal Medicine 85:447-452.

Kaplan NM, Opie LH. 2006. Controversies in hypertension. The Lancet 367:168-176.

Kaufman JS, Owoaje EE. 1999. Blood pressure change in Africa: Case study from Nigeria. Human Biology 71(4):641-658.

Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. 2005. Global burden of hypertension: analysis of worldwide data. The Lancet 365:217-223.

Krupnik I. 1993. Arctic adaptations: native whalers and reindeer herders of Northern Eurasia. Hanover, NH: University Press of New England.

Last JM. 1995. A dictionary of epidemiology. Third Edition. New York, NY: Oxford University Press.

Leonard WR, Katzmarzyk PT, Crawford MH. 1996. Energetics and Population Ecology of Siberian Herders. American Journal of Human Biology 8:275-289.

Leonard WR, Snodgrass JJ, Sorensen MV. 2005. Metabolic Adaptation in Indigenous Siberian Populations. Annual Review of Anthropology 34: 451-471.

McEwen BS, Stellar E. 1993. Stress and the individual. Archives of Internal Medicine 153: 2093-2100.

McGarvey ST, Bindon JR, Crews DE, Schendel DE. 1989. Modernization and adiposity: causes and consequences. In: Little MA, Haas JD, editors. Human population biology: a transdisciplinary science. New York: Oxford University Press. p 263-279.

Nayyar D. 2006. Globalisation, history and development: a tale of two centuries. Cambridge Journal of Economics 30:137-159.

Newell-Morris L. 1995. Thoughts on gender-related research: models, myths, and medicine. American Journal of Human Biology 7:207-212.

Oparil S. 1995. Hypertension in postmenopausal women: pathophysiology and management. Current Opinion in Nephrology and Hypertension 4:438-442.

Piko BF. 2004. Interplay between self and community: a role for health psychology in Eastern Europe's public health. Journal of Health Psychology 9(1):111-120.

Redfield R, Linton R. Herskovits MJ. 1936. Memorandum on the study of acculturation. American Anthropologist 38:149-152.

Ruff C. 2002. Variation in human body size and shape. Annual Review of Anthropology 31:211-232.

Schall JL. 1995. Sex differences in the response of blood pressure to modernization. American Journal of Human Biology 7:159-172.

Slezkine Y. 1992. From Savages to Citizens: The Cultural Revolution in the Soviet Far North, 1928-1938. Slavic Review 51(1):52-76.

Sorensen MV, Snodgrass JJ, Leonard WR, Tarskaia A, Ivanov KI, Krivoshapkin VG, and Spitsyn VA. 2005. Health Consequences of Postsocialist Transition: Dietary and Lifestyle Determinants of Plasma Lipids in Yakutia. The American Journal of Human Biology 17:576-592.

Spiegelman D, Israel RG, Bouchard C, Willett WC. 1992. Absolute fat mass, percent body fat, and body-fat distribution: which is the real determinant of blood pressure and serum glucose? American Journal of Clinical Nutrition 55:1033-1044.

SPSS, Inc. 2003. SPSS 12.0 software. Chicago, Illinois; SPSS, Inc.

Stamler J, Rose G, Stamler R, Elliott P, Dyer A, Marmot M. 1989. INTERSALT study findings: public health and medical care implications. Hypertension 14(5): 570-577.

Stamler J. 1991. Epidemiological findings on body mass and blood pressure in adults. Annals of Epidemiology 1:347-362.

Stevenson DR. 1999. Blood pressure and age in cross-cultural perspective. Human Biology 71(4):529-554.

Weinsier RL, Norris DJ, Birch R et al. 1985. The relative contribution of body fat and fat pattern to blood pressure level. Hypertension 7(4):578-585.

Wessen AF, Hooper A, Huntsman J, Prior IAM, Salmond CE, editors. 1992. Migration and health in a small society: the case of Tokelau. New York: Oxford University Press.

Wolfe TC. 2000. Cultures and communities in the anthropology of Eastern Europe and the former Soviet Union. Annual Review of Anthropology 29:195-216.

World Health Organization. 2004. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet 363:157-163.

Zubok VM. 1995. Russia: Between peace and conflict in Holm H. and Sorensen G. (Eds.), Whose world order? Uneven globalization and the end of the Cold War. Boulder, CO, Oxford: Westview.